

## LARVAL AND PUPAL DESCRIPTIONS OF *MARILIA FUSCA* (TRICHOPTERA: ODONTO- CERIDAE)<sup>1</sup>

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**ABSTRACT:** The larva and pupa of *Marilia fusca* from Australia are described and illustrated.

The genus *Marilia* is composed of two species in Australia: *M. fusca* Kimmins and *M. bola* Mosely (Neboiss 1983, 1986). Additional species of *Marilia* have been recorded from Oriental regions, China and South and North America (Wiggins 1977). Both Australian species were reported to have the same distribution: New South Wales and the southeast coastal ranges of Australia (Neboiss 1983). *M. fusca* was described by Kimmins (Mosely and Kimmins 1953) from adults taken at Epping, NSW, but no descriptions of the immature stages were included. This is the first recorded association of the immature stages of *M. fusca* with that of the adult. Identification and association of the immature stages, based on two pharate males, were made by Dr. A. Neboiss, Curator of the Entomology Department, Museum of Victoria, Melbourne, Australia.

Ulmer (1955) described and illustrated the larvae and pupae of *M. sumatrana* Ulmer from Sumatra and Java (Sunda Islands). Wiggins (1977) provided generic characteristics and the description of *M. flexuosa* from North America. The other North American *Marilia*, *M. nobscia* Milne, has been associated with the adult (Wiggins 1977) but apparently no descriptions nor illustrations were published. The pupae of *M. major* Muller and *M. minor* Muller from South America were described by Thienemann (1905). Unfortunately, the larva of the other Australian species, *M. bola*, is not known. The larvae of *M. fusca*, *M. flexuosa* and *M. sumatrana* share several characteristics: metanotal setal area 1 (=sa1) sclerites large and rectangular; metanotal sa3 sclerites small and rectangular; fore tibia approximately same length as tarsus; labrum with 6 long setae across central part; anal claw lacking dorsal accessory hook; and lateral sclerite of anal proleg edged mesially with stout spines.

There are, however, several characteristics that can be used to differentiate these three species. In *M. fusca* and *M. flexuosa*, the mesonotal plate is subdivided into 3 sclerites, whereas in *M. sumatrana* the mesonotal plate is not subdivided. The ventral apotome of *M. flexuosa* and *M. sumatrana* completely separates the genae, but in *M. fusca*, the ventral

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apotome separates the genae to approximately the midpoint of the ecdysial line. The anterolateral corner of the pronotum of *M. flexuosa* and *M. sumatrana* is rounded; in *M. fusca* it is slightly pointed but not produced into a sharp point as in two other genera (*Parthina* and *Psilotreta*) of North American odontocerids (Wiggins 1977). In *M. fusca* and *M. flexuosa*, the lateral sclerite of the anal proleg possesses 3 very long setae on the mesial margin, whereas *M. sumatrana* possesses a dense cluster of setae at the apex of the hind tarsus; this cluster of setae is lacking in *M. flexuosa* and *M. fusca*.

The pupae of *M. fusca*, *M. sumatrana*, *M. major* and *M. minor* can be separated on the basis of the teeth (serrations) of the anal processes. In *M. sumatrana*, several prominent teeth are located on the hooked apex of the anal process. In *M. fusca*, a few low teeth are found just proximad of the apical hook with one small tooth on the inner margin of the hook. The anal process of *M. major* has several prominent teeth ending considerably proximad of the apical hook. In *M. minor* prominent teeth extend to the base of the apical hook. The pupal mandibles of these four species are basically similar, i.e. thick basally with a flattened bladelike distal portion which is strongly attenuated. In *M. fusca* the attenuated portion is approximately equal in length to the distal bladelike portion; in *M. major* and *M. minor*, the attenuated portion is less than half the length of the bladelike portion. The tip of the attenuated portion of the mandible of *M. sumatrana* is subdivided into several small points (or teeth), whereas, in *M. fusca*, the tip of the mandible is simply pointed.

## MATERIALS AND METHODS

The specimens of *M. fusca* used to describe the immature stages were collected in the Yarra River near Reefton, Victoria, Australia. Illustrations were prepared from specimens preserved in 80% ethanol using a squared ocular grid in a stereo binocular microscope. For greater detail, larval and pupal structures were dissected, mounted in Hoyers mounting medium on a microscope slide, and examined using a compound microscope at 100X-400X magnifications. Measurements were made with a calibrated ocular micrometer or the squared ocular grid.

### LARVA

Overall length of final instar 10-12.5 mm.; body creamy-white (Figure 1).

**Head** (Figures 2-4): Head capsule (measured from anterior margin of frontoclypeus to posterior margin of capsule) slightly longer (1.165 mm) than wide (1.0 mm), sides subparallel. Color pattern distinct: very dark brown bands extending from anterior margin on either side and mostly parallel to frontoclypeal and coronal sutures; mesal portions of frontoclypeus lighter brown; lateral areas light yellow-brown or tan; ventral and lateroven-

tral areas very dark brown with a few paler muscle scars on posteroventral areas. Eyes surrounded by pale areas. Very weak lateral carina extending posteriad from near base of mandibles just dorsad of eye and slightly beyond. Antennae small, just posteriad of dorsal articulations of mandibles. Ventral apotome elongated, triangular, separating genae for approximately one-half their length. Mandibles (Figure 5) stout, pointed, with a few low subapical teeth on dorsal cutting edge; setae and mesal brush lacking. Labrum (Figure 6) slightly rounded anteriorly and narrowed posteriorly; 4 pairs of setae arising from dorsal surface; 2 pairs of curved, pale setae arising from anterior margin.

**Thorax** (Figures 7-8): Pronotal plates heavily sclerotized; dark brown band on either side of mesal suture forming a distinct mid-dorsal stripe; each plate light brown with dark brown margins; anterior margin of each plate with 2 long, dark setae and a few short, pale setae; anterolateral margins slightly pointed, each with a long, dark seta; ventrolateral margins each with 5-7 setae; a group of 7-9 setae just dorsad of mid-ventrolateral margin arising from area slightly darker brown than ground-color; an oblique row of 4 long, dark setae dorsad to this row; posterolateral margin very dark brown and somewhat sinuate.

Each mesonotal plate subdivided into 3 sclerites (anterior, posterior and lateral) separated by distinct sutures. Anterior plates subquadrate, light brown with dark brown mesal bands; each plate with several short, pale setae along anterior margin and 4 long, dark setae just posteriad. Posterior plates rectangular, light brown with dark brown mesal bands; anterolateral corners dark brown and discontinuous with dark brown posterolateral corners of anterior plates; posterior margins very dark brown, somewhat serrated; each plate with 5 long, dark setae just posteriad of anterior margin. Lateral plates elongated, dark brown, each with a few long, dark setae and several shorter, pale setae on anterior half.

Metanotum with 2 pairs of heavily sclerotized plates. Larger, mesal plates subrectangular, each with pale brown margin and lighter central area; each with 10-15 short, pale setae along anterior margin, 4 long, dark setae just posteriad of anterior margin, and 6 long, dark setae along posterior margin. Smaller, lateral plates elongate, narrow, each with approximately 14 short setae.

Prosternite well-developed, brown and irregularly shaped; middle of anterior margin broadly truncated and produced anteriorly; anterolateral margins pointed; lateral margins oblique; and posterior margin slightly concave. Mesosternum with 2 pairs of light-brown, rectangular plates; anterior pair about 1.5X wider than long; posterior pair narrow, about 4X wider than long. Metasternum lacking sclerotized plates but with 2 pairs of lateral and 1 mesal lightly pigmented areas.

**Legs** (Figures 9-11): Anterior legs short, slightly robust, protrochantin poorly developed, bluntly rounded at apex from which arises a short seta. Middle legs slightly longer. Posterior legs longer, more slender. All legs with numerous setae. Claws slender, curved, each with a basal seta.

**Abdomen** (Figures 1,12): Creamy-white with distinct purple speckling on dorsum and sometimes fainter purple speckling along midventral line. Dorsal spacing hump of segment I moderately developed with a pair of setae (1 long, 1 short) on each side. Lateral spacing hump of I with well-developed, light-brown, irregular-shaped sclerite with about 10 vertical rows of filelike ridges; single setae dorsad and ventrad of sclerite. Segments II-VII with several pairs of very short, pale setae visible only at high magnification. Segments II-VII with mid-lateral, dense row of very fine, inconspicuous, pale hairs. Segment VIII with a row of 23-30 bifid lateral tubercles (also termed bifid spicules by Neboiss 1977) (Figure 12). Segment IX with a pair of short, lateroventral setae; dorsal sclerite weakly-developed with 2 long, dark and 3 short, pale pairs of setae along posterior margin. Lateral sclerite of anal proleg well-developed, slightly pigmented; 3 long, dark setae arising from posterior margin; a single shorter, dark seta dorsad of anal claw and a single, short pale seta dorsad of the 3 setae. Posterior margin of lateral sclerite distinctly serrated with approximately 10 very dark teeth. Ventral sole plate with two setae. Anal claw lacking dorsal accessory hook but

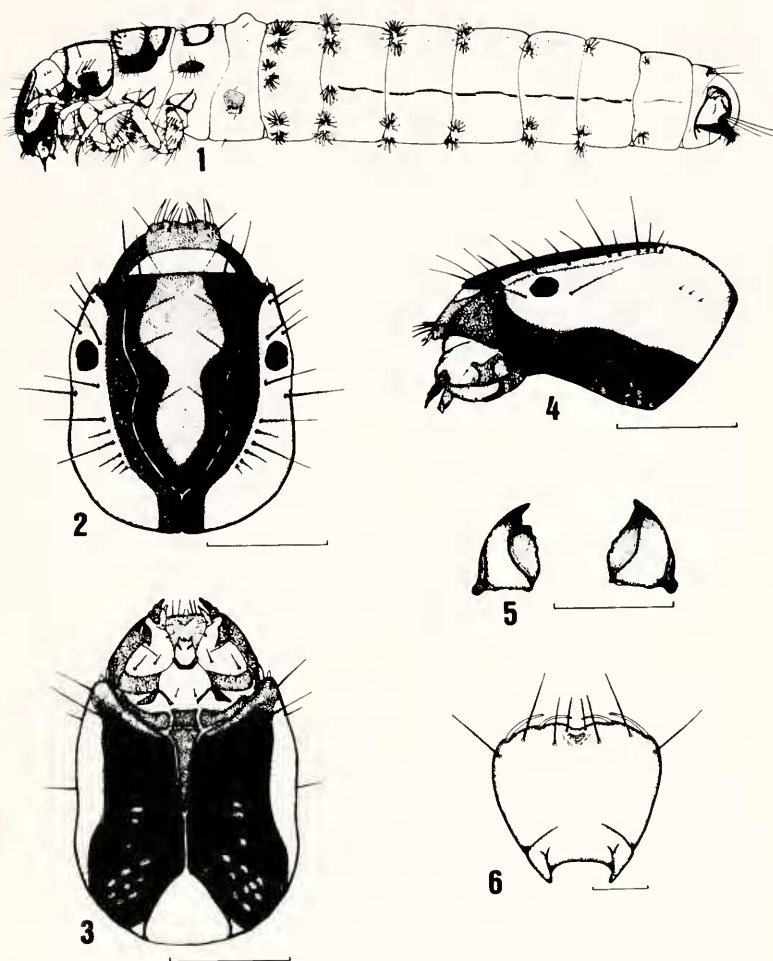
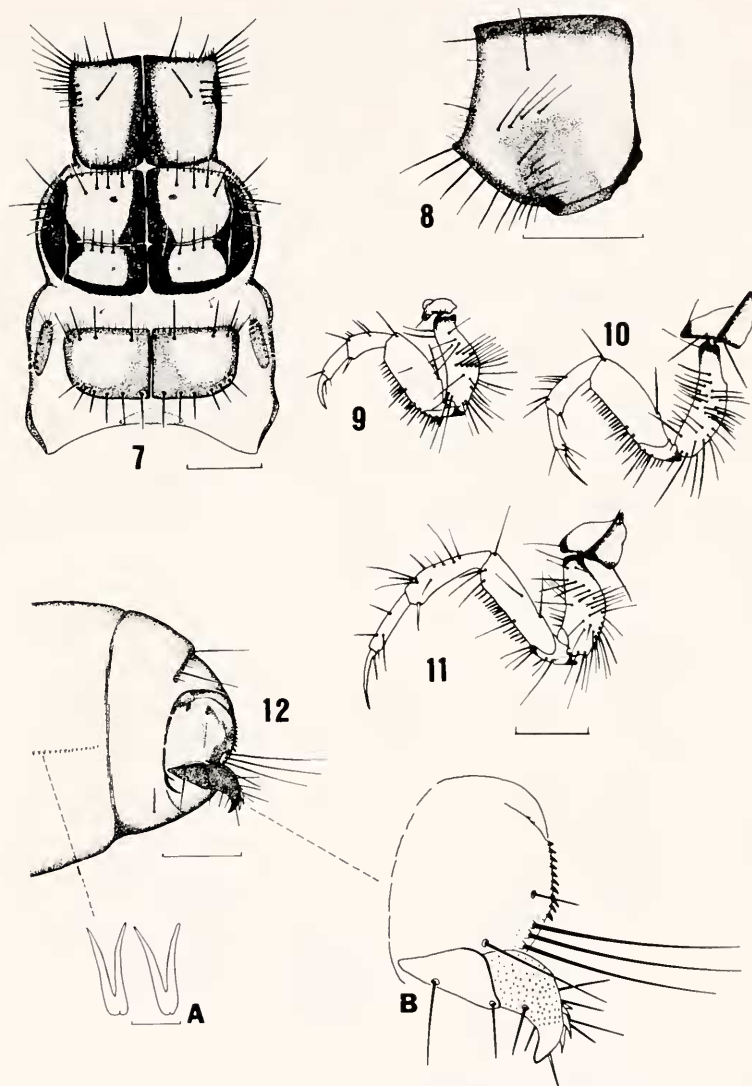


Figure 1. *Marilia fusca* larva, lateral. Figures 2-6: *M. fusca* larva. 2. head, dorsal; 3. head, ventral; 4. head, lateral; 5. mandibles, ventral; 6. labrum, dorsal. Scale lines: 0.5 mm (Figs. 2-5), 0.1 mm (Fig. 6).



Figures 7-12: *M. fusca* larva. 7. thorax, dorsal; 8. pronotum, lateral; 9-11. anterior, middle and posterior legs; 12. terminal abdomen, lateral, A - enlarged lateral tubercles of segment VIII; B - terminal segment enlarged. Scale lines: 0.5 mm (Figs. 7-12); 0.025 mm (Fig. 12A, lateral tubercles).



with 5-6 stout spines and 6 setae arising from mesal surface; basal two-thirds of claw with sparse, very tiny spines.

**Gills:** Paired abdominal gills on segments II-VIII (Figure 1); single or double gills (each gill arising independently) each with a few to several digitiform filaments, located at the anterodorsal (AD), anterolateral (AL) or anteroventral (AV) positions depending on the segment. Gill arrangement: segment II with double AD, AL and AV gills; segment III with double AD and AV and single AL gills; segments IV and V with double AD and AV gills; segments VI and VII with single AD and double AV gills (VII AD gill infrequently absent); segment VIII with single AD (sometimes absent) and AV gills. The number of digitiform filaments per gill is reduced on posterior segments.

**Case** (Figure 13): Maximum length 12 mm; anterior and posterior openings circular, diameters approximately 2 and 1 mm, respectively. Constructed of small sand grains; contour smooth, slightly curved and tapered posteriad. Posterior opening partially occluded by vertical, silkened projection from ventral margin. Line of transverse discontinuity (Figure 13, arrow) distinct in some cases, more frequently in cases of early instars.

## PUPA

**Head** (Figure 14): Antennae very long, extending posteriad along body; distal portions coiled around abdominal apex 5 times. Vertex with paired setae. Frontoclypeus with 2 pairs of setae. Paired setae mesad of each eye. Labrum subquadrate, anterolateral angles somewhat rounded; 3 pairs of setae at each posterolateral angle, 1 seta along each lateral margin, and 4 pairs of setae at each anterolateral angle. Mandibles (Figure 15) broad, thick basally, each with a pair of setae; distally flattened and bladelike with strongly attenuated, hooked apex; proximal portion of blade with numerous minute serrations on outer margin.

**Legs:** Mesotibia and mesotarsi with fringe of long hairs. Fringe lacking on pro- and metathoracic legs.

**Abdomen** (Figure 16): Creamy-white with faint purple speckling along mid-dorsum of segments II-V (Figure 16, arrow, segment II). Dorsum of segment I with 4 pairs of setae and a narrow band of short, stout denticles along posterior margin. Dorsum of segments II-VI with 2 pairs of short setae; dorsum of segments VII-VIII each with a pair of short setae anteriorly and 3 pairs of long, dark setae near posterior margin. Segments II-VII each with a pair of dorsolateral, longitudinal, pigmented bars each with anteromesal projection; those of segment VIII connected by anteromesal projections. Ventrolateral longitudinal, pigmented bars similar but lacking anteromesal projections. Venter of segment VIII with 2 dense patches of hairs along posterolateral margins. Lateral abdominal fringe lacking. Anterior hookplates (Figure 16.A) on segments III-VII small, oval, each with single, caudally-directed hook; posterior hookplates (Figure 16.B) on segment V subrectangular, each with 2 anteriorly-directed hooks. Anal processes (Figure 16.C) long, narrow, slightly tapered and divergent distally; apices recurved and hooked; a few low serrations just proximal of apex; conspicuous setae lacking but with sparse, short setae along length of process.

**Gills:** Abdominal gills on segments II-VII similar to larval gills. Gill arrangements: segment II with double AD, AL, and AV gills; segment III with double AD and AV and single AL gills; segment IV with double AD and AV gills; segment V with double (sometimes single) AD and AV gills; segment VI with double AV gills; segment VII with double (sometimes single) AV gills. The number of digitiform filaments per gill is highest on anterior segments (e.g. 30 filaments on AD gill of segment II) and decreases on posterior segments (e.g. 10 on AV gill of segment VII).

**Case:** Similar to larval case but slightly less tapered and curved. Anterior margin

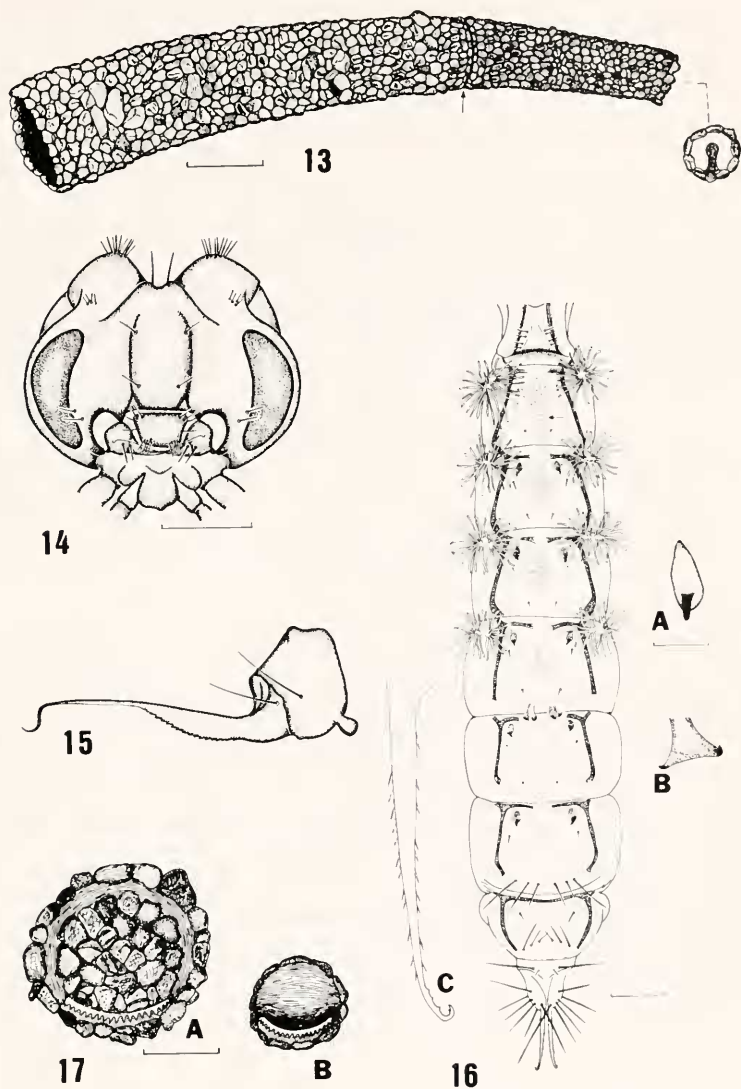


Figure 13: Larval case, lateral, with posterior opening; Figures 14-17: *M. fusca* pupa. 14. head, anterior; 15. left mandible; 16. abdomen, dorsal. A - anterior hookplate, B - posterior hookplate, C - anal process; 17. case, A - anterior opening, B - posterior opening. Scale lines: 1.4 mm (Fig. 13); 0.5 mm (Figs. 14, 16); 0.1 mm (Figs 14 A,B - hookplates); 1.0 mm (Figs. 17 A, B).

(Figure 17.A) slightly flared, with opening partially closed by slightly convex, silkened partition attached just inside opening; sand grains embedded in partition; partition not attached to case ventrally leaving a narrow, crescent-shaped opening; anteroventral margin of case with numerous toothlike projections. Posterior opening (Figure 17.B) partially closed by a silkened partition, the ventral margin of which is deflected inward and not attached to case leaving a narrow, crescent-shaped opening; posteroventral margin of case also with numerous, toothlike projections. Attachment of case by anterior and posterior silkened filaments. Pupae frequently encountered in cracks and crevices of submerged limbs or other objects.

### SPECIMENS EXAMINED

**Victoria:** 8 larvae and 8 pupae, 8 Nov. 1980; 28 larvae, 13 Nov. 1980; 21 larvae and 29 pupae, 27 Nov. 1980. All specimens collected in Yarra River near Reefton, Victoria, Australia by G. Drecktrah. Voucher specimens deposited in Department of Entomology, Museum of Victoria, Melbourne, Australia and Department of Biology/Microbiology, University of Wisconsin, Oshkosh, WI.

### ACKNOWLEDGMENTS

I wish to thank Arturs Neboiss, Curator, Department of Entomology, Museum of Victoria, Melbourne, for his assistance and guidance in this study and for identifying the specimens. Appreciation is extended to the Board of the Museum of Victoria for providing me the opportunity to work in the Department of Entomology. I also wish to thank John Morse, Clemson University, and Glenn Wiggins, Royal Ontario Museum, for providing suggestions in preparing this manuscript.

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